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Meeting on Selected Branches of the
Food Processing Industry in the Middle East

Beirut, 3-8 March 1975

THE SUGAR INDUSTRY IN LEBANON[1/]

by

Raja Tannous*

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* Associate Professor of Food Technology and Nutrition
American University of Beirut

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Selected Branches of the Wood Industry
in Selected Countries of the Middle East

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I. Introduction

The sugar industry in Lebanon started in 1937 as an industry of processing and refining of imported raw sugar. Again much of the demand was satisfied by the importation of refined sugar.

Today, there are three such factories that convert imported raw sugar into refined sugar. Also in 1957 the first and only factory that processes sugar from sugar beets started operation. All four plants are in operation now and they satisfy the major portion of the demand for sugar in Lebanon, thus constituting one of the major food industries in the county. An account of the four plants in Lebanon is shown in Table 1.

II. Raw Materials

1. Availability

Because of the good price offered for sugar beets, Lebanese farmers have found beet production very profitable compared to production of other crops. As a result they have been producing almost too many sugar beets. Thus the availability of beets for the sugar factory was more than adequate.

However, recently it has been observed that sugar beet planting is gradually decreasing due to the following reasons:

a. Rotational planting cycle should be followed if good yields are to be followed if good yields are to be maintained.
b. Manpower is becoming increasingly expensive.
c. Chemical fertilizers have become very expensive.
d. During the last three years, there was scarcity in water for irrigation.
e. Unexpected decrease in sugar content of beets grown in Lebanon.

Thus it appears that at present the supply of beets is adequate.

2. Suitability

Generally the beets grown in Lebanon are suitable for the sugar industry. However, in recent years the sugar content of the beets have been decreasing, unexpectedly. The reasons for this problem are not very clear, but may be due to the increased use of fertilizers and irrigation water.

3. Prices

The price of sugar beet that the Government paid the farmers during the 1972-73 season was 60 L.L. per ton, delivered at the factory.

The price set for the 1973-74 season is 75 L.L. per ton of beets containing 16% sugar. Should the beets contain more or less than 16% sugar, the price paid will be respectively increased or decreased.

The sugar factory is expected to produce 1 kg of sugar out of every 8.7 kg of beets (or 115 kg from every ton). And for this operation the sugar factory is paid 270 L.L. per ton of sugar it produces.

Again the sugar factory sells the seeds to the farmers at the price of 4.50 L.L. per kg.; and every 1 kg of seeds is sufficient for planting 330 sq. m. of land.

4. Imports

There is no import of sugar beets into Lebanon. However, Lebanon imports large quantities of raw sugar for refining in Lebanon. This contributes the operation of three of the existing factories.

The amounts of raw sugar imported into Lebanon are shown in Table 2. It can be observed that the imports of raw sugar into Lebanon has been increasing.

5. Exports

There are no exports of sugar beets or raw sugar from Lebanon as part of the industrial sector. Some quantities of raw sugar may pass through Lebanon in transit to other countries.

Summary

In summary it can be concluded that the raw material sugar beet is available in sufficient quantities at prices advantageous to both the farmers and the sugar factory, although the beets are not always of the required quality in terms of sugar content. Again, for the sugar refining factories, sufficient quantities of raw sugar are imported into Lebanon.

III. Production and Processing

A. Description of existing plants

1. History

The first factory in Lebanon for refining sugar from raw sugar started in 1937 and was located in Chekkah. Since then two other plants for refining sugar were constructed in 1950 and 1956 (Table 1).

The only factory in Lebanon that can process sugar from raw beets is located at Anjar and started operating in 1957. This factory also has the capacity to refined raw sugar. However, it should be mentioned that the Government showed intention to allow the building of another factory that can process sugar from raw beets. This new factory was to be completed in 1975, and be located in the Beqa'a with a capacity for 60,000 tons of beets and 24,000 tons of refined sugar.

2. Location

The location of the factory that can process raw beets is in the Beqa'a valley, since that is the area where beets are grown. Again, if another factory is to be built it should be located in the Beqa'a, since that is the suitable and logical location for it.

However, the refining factories are distributed among the Beqa'a valley, Beirut area, and Chekkah in the north, as shown in Table 1. This distribution of the refining factories is of an advantage to Lebanon in distributing the industrial sector to cover all parts of the county.

3. Capacity

The capacity and volume of production of the different sugar factories in Lebanon are shown in Table 1.

The capacity of the Anjar factory was about 1300 tons per 24 hours during the last processing season 1973-74. It is expected that with the installation of the new Diffuser the capacity will be about 2000 tons per 24 hours during the 1974-75 season. Thus the capacity of the Anjar plant for processing beets is over 150,000 tons per season. Considering the conversion ratio of 100 tons of beets to 13 tons of sugar, the capacity of the plant will be well over the 15,000 tons figure given in Table 1.

As for sugar refining, in Lebanon there is excess refining capacity, and the factories are presently utilizing only a small portion of their installed capacity. The reason behind this is that imported raw sugar is allocated among the factories in proportion to their installed capacity.

Thus all plants have plans to increase their capacity, while no justifiable reason exists for it. This means that either the Government or the consumer will eventually and unnecessarily pay for this, depending on the pricing policy at the time.

4. Volume of Production

The estimated production of refined sugar in Lebanon in 1971, was about 68,000 tons as shown in Table 1. It is also estimated that last year, the production was at least 75,000 tons.

5. Description of sugar processing from beets

The trucks empty the sugar beets in 3 horizontal silos, water carries the beets to the pump that pumps the beets to the top of the factory where they are washed thoroughly by water. Next the beets are transferred by a belt conveyer to the high-speed beet slicers where they are changed into cossettes, average dimensions 3 cm x 1 cm x 1 cm. These cossettes are then blanched by steam to inactivate the surface enzymes and to expand the beet cells for easy rupture and easy extraction of sugar. Next the blanched cossettes are vertically transferred from bottom to top of a vertical Extractor called diffuser in the sugar terminology where sugar dissolves in hot water whose temperature, pH, dispersed ions are electronically controlled, this water which has the sugar dissolved in it is now called RAW JUICE. Cossettes, which are now free of sugar except for traces which range between 0.1% and 0.7% and which depends on the efficiency and close control of the extractor, are now pressed and is called now pressed pulp. This pulp is now transferred to a Forced-draft oven and is dehydrated at a temperature which ranges between 75-95°C depending on the pressed pulp. Final moisture content of dry pulp ranges between 11-13%. It is important to maintain this moisture content since higher figures might cause the pulp to ferment and thus decreases its shelf-life, lower figures all might decrease the ignition temperature at which the pulp might easily catch fire. The dried pulp is sold to the farmers as a feed for the dairy animals, factory is entitled to sell the dried pulp to the farmers at .... L.L. per ton delivery at factory.

6. Level of technology

The processing equipment in the sugar factories is good equipment, but has become old. Periodically more equipment has been installed, but only to increase the capacity. However, automation and computerising the processing equipment may be introduced. There is room for improvement. Thus the level of technology is a less costly mechanical, compared to new improvements in more advanced countries.

7. Manpower and labour

Labour and manpower are available in abundance. Labour is semi-skilled and trained mechanics are well experienced.

8. Organisation and management

It appears that there is room for better organisation and management in the sugar factories in general.

9. Technical consultants

Consultants to the factories are available throughout the operating season. Some of these consultants are foreign working with the factories on contracts.

10. Quality control facilities

Quality control laboratories are available at the sugar factories. However, some of the equipment used has become old and outdated. Thus there is room for improvement in the Quality Control facilities. New and efficient equipment is available now on the market.

Quality control tests run in these laboratories included the following tests:

1. Sugar content (by polarimetry)
2. Total soluble solids (by refractometers)
3. Purity
4. CO_2 content
5. pH
6. Moisture content (by infra red)
7. Invert sugar
8. Ash content

11. Suitability for expansion

It appears that the Anjar plant is suitable for expansion as far as the processing aspect is concerned. The availability of raw materials should be taken into consideration.

B. Problems facing the existing plants

1. Processing problems

There appears to be no major processing problems facing the sugar factories. However, as for the Anjar plant, one such problem may arise from the unsuitable quality of the raw materials (sugar beets) at certain times. This is in reference to the low sugar content or high mineral content beets that are received at the plant. With such raw materials it becomes increasingly difficult to produce the high quality product desired.

2. Quality control

Because of the lack of an efficient and guide system of quality control during the processing procedure, the control of the quality of the final product or refined sugar becomes difficult. Thus, again the quality of the product may not always be as desired.

3. Manpower

There appears to be no major problem with available manpower.

4. Professional and technical personnel

The sugar factories, similar to other food plants in Lebanon, have the problem of lack of local professional personnel. Trained local food technologists trained in the sugar industry are unavailable. Thus these factories depend on foreign personnel for the highly technical matters.

5. Water

There is no water problem for these factories. There is sufficient water which goes through water treatment at the factories before use.

6. Electricity

There is no electricity problem. All the factories have their own stand-by generators.

7. Transportation

The only transportation problems are due to bad weather conditions. There are mainly two obstacles: (a) when there is snow and this hinders transportation; (b) when it rains heavily, there are difficulties for trucks going into the fields. However, these conditions are not very frequent and should not be considered as a major problem.

8. Financial

It does not appear that there are any financial problems that are a hinderance to the sugar factories in Lebanon.

III. Final Products

A. Brief description of products

1. Quantity produced

As mentioned before, it is estimated that a quantity of 75,000 tons of refined sugar was produced last year in Lebanon.

2. Packaging

The Anjar plant packages it's refined sugar in 100 kg jute bags. Other refining factories package their products in 50 kg, 70 kg, and 100 kg jute bags.

Also two factories manufacture sugar cubes which are packed in kilogram carton packages.

3. Quality

The Lebanese Standard for sugar is shown elsewhere in this report. The standard is compulsory. However, it may be mentioned that refined sugar manufactured in Lebanon does not necessarily adhere to the Lebanese Standard set in 1964. The product may adhere to the Standard, but not necessarily intentionally produced to adhere to the Standard.

In general the quality is adequate, by many batches put on the market are of poor quality due to reasons mentioned before.

4. Marketing

All the marketing of sugar produced by the sugar factories in Lebanon are marketed under the supervision of the Government. Specifically, the Office for Cereals and Sugar in the Ministry of National Economy is the responsible office for the sugar industry.

5. Marketing Prices

The retail price for sugar at present is about 75-80 P.L. for refined sugar, and about 100 P.L. for sugar cubes. Again the imported similar products are more expensive.

It should be mentioned here that although retail price for sugar is about 75-80 P.L. per kilogram, the actual cost of raw sugar is much more than that; however, the Government is subsidizing this and is paying for the difference.

Recent official bulletins give the wholesale price for refined sugar as 73 P.L. per kg while the retail price is 80 P.L.

B. Trends during the last few years

1. Imports

The trends in imports of raw and refined sugar into Lebanon are shown in Table 2. It can be observed that the import of raw sugar has been increasing generally during the last few years; while no trends are apparent for the imports of refined sugar.

2. Exports

Sugar is not exported as such from Lebanon. However, large quantities are exported as part of processed foods such as confectionary and jam.

It is estimated in Lebanon that 65% of all sugar produced locally is consumed by the food industry. One factor that encourages this pattern is that sugar, because of the Government subsidy, is cheaper in Lebanon for the food industry than in the other neighboring countries.

3. Production

The trends in the production of beets and refined sugar in Lebanon over a ten-year period are shown in Table 3. It can be observed that beet and sugar production increased until the year 1966, and then from 1966 to 1970 no noticable change occurred. However, although

not shown in Table 3, it is estimated that since 1970 beet and refined sugar production have increased as shown by the 1974 values. One reason for this is the increased demand for sugar by the food industry.

4. Consumption

It is estimated that consumption of sugar in Lebanon is about 75,000 tons per year. This means that the average consumption per capita is about or over 25 kg per caput per year. However, it is difficult to make any definite conclusions on trends since part of this consumption goes into processed foods that are exported from Lebanon.

5. Prices

Trends in the wholesale and retail prices of refined sugar in Beirut are shown in Table 4. It can be observed that the trend is towards a slow increase in both prices. Actually, the increase per year can be considered as very small.

6. Projected trends

Projected trends in the production and consumption of refined sugar in Lebanon are presented in Table 5. However, the values given in the table which was published in 1971 do not show the true picture any more. It is estimated now that the present consumption of sugar is in the order of 75,000 tons, and therefore the consumption in 1977 will be considerably more than the given 65,000 tons.

Again concerning the projected production of 62,000 tons in 1977, there is no strong reason to believe that production will not be much more than 62,000 tons, since the capacity of the already existing plants can reach 130,000 tons as shown in Table 1. It appears that the refining factories are ready to process sufficient quantities of imported raw sugar to satisfy the demand, since they are paid according to the amount they process. However, this will depend on the Government policy concerning the imports of raw sugar and whether it intends to limit imports to any degree, since the Government is subsidizing imported raw sugar.

Government Policy

Recently the government office concerned with the sugar industry which is the "Wheat and Sugar Beet Office" in the Ministry of National Economy is completing studies in which they are evaluating the whole industry ranging from beet production to refining and distribution. According to the Office, the studies should lead to a new sugar policy in Lebanon the intention of which would be to achieve the following:

a) Higher prices paid to beet growers to encourage increased beet production.
b) Setting strict quality standards so that a standard product will be marketed.
c) to restrict distribution of sugar to wholesalers and not to food factories.

The food factories are left then with two alternatives:

(1) either buy their needs for sugar from the free market, or
(2) reduce the price of their commodities that utilize sugar commensurate to the reduced price of sugar that they purchase from the Government.

V. General Conclusions and Recommendations

The sugar industry is one of the major food industries in Lebanon, although the processing of sugar from beets is still limited to one plant in the Beqa'a, while three other plants satisfy the demand by converting imported raw sugar into refined sugar.

Up to the present, the production of beets has been sufficient for the production volume of the existing factory, generally, the quality of the beets grown has been adequate, although in recent years the sugar content of the beets have been decreasing. Should the volume of production of sugar from beets increase in the future, consideration should be given to increasing beet production in Lebanon.

From the technical point of view it appears that there is room for improvement and in upgrading the existing level of technology. Processing techniques could be improved as well as quality control procedures and instrumentations used. Also there is a lack of trained local experts for this industry.

The volume of production should be sufficient for the demand, although at times sugar seems to be missing from the market. However, should the demand increase, the existing plants can increase their production to satisfy the consumption values.

The quality of the final refined sugar product is not always of the degree desired. Often, batches of poor quality sugar are marketed and an improvement in that area is needed.

Economically, the industry must be profitable to the existing plants since they are paid per ton of sugar they process. However, the Government burdens heavy losses from this industry since it purchases the raw sugar at a much higher price than the market price. Thus any increase in the price of sugar, the Government and the consumer pay for that, while the industry remains unaffected. Again, since the food industry purchases sugar at a lower price than that existing in neighbouring countries, large portion of the sugar consumption go into the confectionary and other related industries, again putting a burden on the Government. Thus a real assessment of the sugar situation in Lebanon should be carefully carried out in preparation for a better sugar policy in Lebanon.

The recommendations that can be offered at the present can be summarized into the following:

1. Should the production of sugar from beets be increased, encouragement in beet production should be considered. Sugar production from beets should be encouraged to make Lebanon more self-sufficient in Sugar.
2. Consideration should be given to improving the quality of beets produced, in particular to sugar content.
3. There should be an improvement in the level of technology with respect to processing and quality control techniques and instrumentation. Training of local experts is needed.
4. There should be an improvement in the quality of the refined sugar produced, and there should be strict adherance to official food standards.
5. The policy governing the sugar industry should be reconsidered to review the interrelationship of the Industry, Government and Consumer to sugar availability and costing for the interest of the three parties concerned.

Table 1. Sugar Factories in Lebanon (1971)

Plant	Year Started	Capacity of Refined Sugar (Tons)		Production of Refined Sugar (Tons)
Beirut	1930	From raw	30,000	30,000
Chekkah	1937	From raw	30,000	11,000
Anjar	1957	From raw & beet	50,000	12,047
		From beet	15,000	
Tripoli	1964	From raw	20,000	15,000
	Total		130,000	68,047

Table 2. Imports of Sugar into Lebanon
(1000 Tons)

Year	Raw	Refined	Year	Raw	Refined
1959	5.9	5	1965	60	21
1960	32.5	3	1966	39.6	5
1961	30.7	5	1967	30.9	4
1962	49.1	3	1968	15	8
1963	24.6	8	1969	31.3	12
1964	7.6	34	1970	44.8	6

Table 3. Trends in Beet and Sugar Production

Year	Area (hectares)	Beet Production (Tons)	Beet Yield (Tons/hectare)	Refined sugar From Beet (Tons)	Refined sugar from imported raw sugar (tons)
1960	850	18,000	21.2	2,486	
1961	800	21,900	27.4	3,238	
1962	1,000	30,000	30.0	3,721	
1963	870	31,000	35.6	3,947	
1964	1,800	77,000	42.8	8,685	
1965	1,500	73,770	49.2	7,895	
1966	2,000	100,000	50.0	12,503	
1967	2,100	110,000	52.3	10,826	27,174
1968	2,500	119,952	47.6	9,806	18,194
1969	2,200	94,000	42.7	9,608	22,392
1970				12,047	
1974	3,000	180,000	60.0	app. 20,000	

Table 4. Prices of Refined Sugar

Year	Whole sale price in Beirut of Refined Sugar L.L./Kg	Retail price in Beirut of Refined sugar L.L./Kg
1960	60	65
1961	60	65
1962	51	55
1963	62	66
1964	82	85
1965	62	65
1966	63	65
1967	63	67
1968	62	68
1969	67	72
1970	74	78
1971	75	79
1972	72	76
1973	74	80

	Raw	Refined
Tariff rates on	81.62%	125%

Table 5. Projections of Refined Sugar Consumption and Production in Lebanon

Apparent Consumption in 1970:	50,000 Tons
Growth Rate:	4%
Projected Consumption in 1977:	65,000 Tons
Projected Production in 1977:	62,000 Tons
Projected shortage in 1977:	-3,000 Tons

Planned New Sugar Factory in Lebanon

Location : Bekaa

Capacity : Beets 60,000 Tons
Refined 24,000 Tons

Completion: 1975

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Introduction:

The canning of fruits and vegetables is perhaps the oldest major food processing industry in Lebanon, and is still one of the major sectors in the industry. Traditionally, a wide variety of fruits and vegetables were and still are preserved on a small scale in villages using traditional methods. Today, however there are several plants that process fruits and vegetables on a large industrial scale, using modern equipments and installation.

In Lebanon, the fruit and vegetable processing industry is varied and utilizes many fruits and vegetables. Some of the major products produced locally in this sector are the following:

1. Pickled vegetables: (Mainly Cucumber, Eggplants, mixed vegetables.)

2. Canned vegetables: (A wide variety exists).

3. Canned fruits in syrup: (Mainly peaches, apricots, pears).

4. Jams , Marmalades, and preserves: (Mainly apricots, strawberries, quince and to a lesser extent cherry).

5. Fruit juices and drinks (A wide variety exists, including apple, orange, lemon, pine apple, and tomato).

In addition to the categories mentioned above, a large portion of the vegetable and fruit canning industry in Lebanon processes legume seeds such as chickpeas and broadbeans.

Because of the wide variety of raw materials and products processed, this report will consider the industry as a whole giving details on individual products wherever possible and feasible.

I. Raw Materials:

Generally most of the raw materials needed for this industry are locally available except for few items that are imported. An example of an imported vegetable is peas.

Fruits for jams, preserves and for canning in syrup are purchased locally. However, for the fruit juice industry, it must be realized that the general practice is to import fruit concentrate bases, which are reconstituted, pasteurized and then canned at the local plants. Pineapple and mango juice concentrates are two illustrative examples.

With regard to the raw materials for this industry, the unavailability of the proper varieties of fruits and vegetables in sufficient amounts at low enough prices are the problems that the manufacturers face. This will be discussed in more details later in the report.

II. Production and Processing:

A. Description of existing industry:

History: The industry of fruits and vegetables processing in Lebanon started about four decades ago, with one large factory until two decades ago. At present these plants count at least nine in number. Several of these plants process fruits and vegetables on a large scale using modern methods and equipments.

Location: The locations of the factories are mostly in Beirut and its suburbs, with two plants in the Beqa'a Valley.

Capacity & Production: As to the capacity of production, plants processing fruit juices are generally operating below their full capacity. The main reason for this is the unavailability of new materials throughout the season.

Data collected by interviews for five plants processing fruit juices including citrus, tomato, apples and other fruits had a total capacity of 21,822 tons of fruits while their actual production was 4,849 tons, during 1971.

On the other hand in the plants which produce canned vegetables in brines and fruits in syrup, a bottle neck in production exist mainly on the processing line from the difference in capacities between sealing machines and retorts, which are major processes in the canning factories.

Level of Technology: In this industry, the level of technology varies widely from one factory to the other. Some factories still maintain old and classical procedures and equipments, while some factories do possess the most modern equipment. However, it should be mentioned that modern equipment does not mean that the best technical procedures are followed, nor does it mean that the best quality products are produced by these plants.

One of the reasons for this is the lack of the local technicaly trained experts at these plants who should monitor production on the day-to-day basis in order that good products with standard quality are produced. Foreign consultants are available at times to solve problems; however, because of the lack of continuity in expertise technology, problems are not tackled efficiently and properly.

Quality control facilities again varies from one factory to the other. Some factories have up to date facilities are using them properly in standardizing the quality of their products. Others have good facilities without making any use of the,while still others have poor facilities to start with.

Considering the suitability of the existing plants for expansion, it can be said that several of these plants have layouts that are suitable for expansion, while others, particularly those located in the Beirut area, are restricted in available space.

B. Problems facing the existing plants:

Many of the problems facing the Lebanese food industry in general also face the plants that process fruits and vegetables. However, some of the following problems are of particular importance to this industry:

(1) Lack of proper variation of fruits and vegetables:-

Most of the fruits and vegetables grown in Lebanon are geared to be sold fresh and no consideration is given to their suitability for processing; and whether they have the specific characteristics, such as heat resistance, texture and color that are required for processing.

(2) High cost of raw materials:-

This is related to No. (1) since all these crops are intended for the fresh retail market, their prices are usually too high for the processing industry compared with prices in other industrial countries. In most cases the industry cannot make predictions about next season's prices.

(3) Unavailability of suitable raw materials:-

What is meant here is that, because these crops are intended to be sold for the retail market, the processor is compelled to collect his raw materials from different locations obtaining different varieties and qualities.

(4) Lack of Standardized quality products.-

Due to the difficulties met with the availability of suitable raw materials, the processed products manufactured lack standardization as to quality factors such as size texture, color and other qualities.

III. Final Products

Brief Description of Products

The major products prepared locally include the following as mentioned before:

a. Pickled vegetables
b. Canned vegetables
c. Fruits in syrup
d. Jams
e. Fruit juices and drinks.

The following is a short description of each of these products.

Pickled vegetables: include mainly pickled cucumbers, mixed vegetables, olives. These are packed in tin cans or glass jars. The quality varies from one brand to the other and range from poor to good. All vegetables are pickled in vinegar, while olives are pickled in brine and lemon juice.

Canned vegetables: include mainly products such as peas, artichoke, green beans, okra and others in brine. Tomato paste is another major canned product. All these products are canned in tin cans, with few products recently appearing on the market packed in glass jars. The quality of these products is generally fair, and could be improved.

Fruits in syrup: are produced on a smaller scale, which may be due to the small demand for these products. These products include mostly peaches and pears in syrup. The quality of these products is fairly good. Fruit cocktails are not produced to any great extent locally.

Jams, marmalades and preserves: are produced on a large scale in Lebanon. These include mainly:

a. Strawberry, apricot and quince jams.
b. Orange marmalades
c. Strawberry preserves.

The quality of these jams is generally very good, some of which can be considered as excellent. Jams are generally canned in tin cans, but recently more products are packed in glass jars, particularly preserves. The lack of a standard texture and consistency is sometimes the major problem with locally prepared jams.

Fruit juices: The juices that are produced in Lebanon include natural juices as well as artificial drinks. The fruit juice industry consists mainly of reconstituting imported fruit juice concentrates. In some products, concentrates are reconstituted to original juice composition, and in other products they are further diluted to become a juice drink, and some products are made completely by mixing chemical ingredients. The big fallacy here is that all of the above products are marketed as fruit juices. Such products, including pineapple, mango, orange, and grapefruit juice and mango nectar are produced by several factories.

These juices are packed either in tin cans of different sizes, or in 'tetra-paks'. Several factories have such facilities and requirements for reconstituting, pasteurizing, sterilizing and canning the juice. As far as juice extraction from fresh fruits, at least one factory has modern equipment and facilities for juice extraction and concentration. However, it is not known how much of this juice or concentrate is used for preparing the local products, and for a time all the juice concentrates produced locally were exported.

There is an urgent need for the standardization of these products that are produced locally.

Trends during the last few years:

To obtain an idea about the trends in volume of production, local consumption and export of the major fruits and vegetable products produced in Lebanon, the attached tables show the available data for the period 1970 - 1973.

It should be mentioned that production values do not account for the combined values of consumption and export, because part of the consumption values are based on imports of the particular product.

It can be observed from Table 1. that production of canned beans, olives, jams and canned vegetables have increased appreciably during the four year period. Similarly their consumption and export values increased. It must be mentioned that exports of jams and canned beans increased more than three folds, while their consumption did not increase in this order. This means that a great part of the increase in production is going into exports.

Considering the pickles industry, the values show a sharp drop in production up until 1973. This however, has changed drastically since 1973 where a new factory for processing pickled started operating and had a production of over 100 tons of pickles in one season.

Again, a sharp decrease in tomato paste production is observed, which is mainly due to unavailability of tomatoes for processing at low enough prices. The reason for the sharp decrease in consumption of tomato paste, however, is not clear.

In general it can be concluded that a gradual increase in production and export has been the trend in most of the canned fruits and vegetable products.

Table 1. The production, local consumption and export of major fruits vegetable products in Lebanon.

JAMS

	1970	1971	1972	1973
Production (tons)	1029.1	1196.7	1145.9	1463.3
Local Consumption (tons)	948.3	801.6	971.7	1224.2
Export (tons)	118.1	168.5	362.9	409.2

CANNED VEGETABLES

	1970	1971	1972	1973
Production (tons)	382.1	673.3	1000.3	869.7
Local Consumption (tons)	421.9	551.5	556.9	646.1
Export (tons)	203.6	155.8	179.2	356.9

TOMATO PASTE

	1970	1971	1972	1973
Production (tons)	353.7	655.1	473.2	215.9
Local Consumption (tons)	747.0	643.2	543.7	314.4
Export (tons)	6.0	3.6	12.2	13.5

CANNED BEANS

	1970	1971	1972	1973
Production (tons)	299.2	579.2	513.4	740.6
Local Consumption (tons)	205.4	281.6	305.3	410.1
Export (tons)	112.2	278.3	177.3	331.9

PICKLES

	1970	1971	1972	1973
Production (tons)	44.0	67.0	15.2	4.8
Local Consumption (tons)	58.7	43.0	47.3	6.3
Export (tons)	5.8	1.7	1.2	1.2

PICKLED OLIVES

	1970	1971	1972	1973
Production (tons	3.3	-	1.1	27.7
Local Consumption (tons)	5.7	2.2	1.2	3.08
Export (tons)	-	-	-	-

Reference: Ministre du Plan, Direction Centrale de la Statistique, Bulletine Statistique Mensuel (Liban).

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Beirut, 3-8 March 1975

A STUDY ON VEGETABLE FATS AND OILS AND ANIMAL FEED INDUSTRY IN THE SYRIAN ARAB REPUBLIC[1/]

by

Adnan Sheikh Al-Kar*

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* Vice Director General and Production Director, Syrian Industrial Co. for Vegetable Oils, Aleppo.

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Introduction

The industry of extraction of vegetable oil and its derivatives is considered among the most important industries in the Syrian Arab Republic. This industry was established as a result of the great expansion which growing cotton reached twenty years ago. The importance of this industry is increasing with the increase of population and with the development of the standard of living.

The establishment of this industry goes back to the year 1945 when the first modern plant for extracting vegetable oils was set up in Aleppo after the Syrian Industrial Company for Vegetable Oils had been founded. In the beginning, the quantities of processed seeds were very little, and did not exceed twenty thousand tons yearly. Then, it did not take long before the number of factories in the region increased along with the production capacity.

At present there are in the Syrian region, seven factories for extraction and refining vegetable oils. These factories are basically designed for pressing cotton seeds. Their actual production capacity is approximately 228000 tons of seeds yearly, and they are located in Aleppo due to the closeness of this city to the sources of raw materials. In Aleppo, there are three factories owned by the Syrian Industrial Company for Vegetable Oils. The actual production capacity of these factories

constitutes about 75% of the total production capacity of the country. Earlier, all these factories had been run by their owning national companies, until they were nationalized early in 1965.

As for olive oil, it is considered the second oil source in the country, and it is entirely produced by the private sector. It includes 986 oil mills. The average olive production during the past eight years amounted to 114000 tons and that of olive oil to 23000 tons.

As regards other seeds, their importance is secondary. Of these, we may mention sesame seed, the average annual production of which amounts to 5800 tons, and it is used, in most part, in making Halawa and Tahina, and peanuts seeds , the annual production of which reaches 15000 tons, and most of which is exported, and what remains in the country is used as food. Also, there are sunflower seeds, the annual production of which amounts to 2000 tons, and it is also used for food.

Oil Raw Materials

1. Cotton Seeds: Cotton is grown in vast areas of land, mainly in the regions of Aleppo and Deir Al-Zour where cotton gins are found in great numbers. There, cotton is ginned, the seeds are removed and then distributed to the factories for pressing.

The following chart shows cotton planted areas quantities of seeds produced and exported and imported.

Description	1965	1966	1967	1968	1969	1970	1971	1972
Area (One thousand hectares)	286	256	239	288	299	249	251	238
Produced cotton seeds	249	220	220	200	200	216	210	224
Imported cotton seeds	0,2	0,1	0,1	00	00	00	00	00
Exported cotton seeds	26	17	6	19	00	00	00	00

From these figures, we notice the constancy of areas of cotton plantations with a slight decrease in the number of hectares. In 1965, for instance, the area was 286 thousand hectares and in 1972, 238 thousand hectares. Similarly, production of cotton seeds in 1965 reached 249 thousand tons while in 1968 it dropped to 200 tons in spite of the fact that the planted area in both cases was the same. The reason is due to the labouring of land and water supply required, and to atmospheric changes in that year. As to the quantities of imported cotton seeds, they were quite small and were farming seeds. As to exported seeds, they were exported in large quantities until 1965 and 1966 when they diminished. and eventually their exportation was completely prohibited, because all seeds had to be locally pressed.

2. Olives: Olives come second to cotton seeds in importance. They are grown in various places and mainly in Aleppo, Idlib and Latakia. Cotton depends entirely on rain water. The following schedule shows the areas of olive plantations, the quantity of yield and import - export activities.

Description	1965	1966	1967	1968	1969	1970	1971	1972
Area (Thousand hectares)	120	140	145	142	142	124	125	149
Yield (One thousand tons)	75	115	120	112	129	85	117	161
Import - Export	00	00	00	00	00	00	00	

In the schedule above, we notice the increase of the cultivated area from 120 thousand hectares in 1965 to 149 thousand hectares in 1972, and indication of the interest in olive growing. Hence, the crop was affected in that it went up to 161 thousand tons in 1972 after it had been 75 thousand tons in 1965. The drop of the crop in 1970 was due to the cold wave which swept the country. As to import - export activity it is nil.

3. Sesame: Sesame is grown in sabulous land. It is mainly used in making Halawa and Tahina. The following schedule shows the area of sesame plantations, quantity of seeds produced and import - export activities:

Description	1965	1966	1967	1968	1969	1970	1971
Area (One thousand hectares)	7	8	12	13	10	6	10
Produced seeds (tons)	4800	5600	9300	8300	5700	2700	4300
Imported seeds (tons)	1512	2907	000	877	1448	218	000
Exported seeds (tons)	131	000	000	44	711	140	000

From these figures we notice the constancy of the areas of sesame plantation and that the quantity of seeds increases with the increase of the cultivated area. As to the imported quantities, they are relatively small. Furthermore, there are other raw materials such as peanuts which are strictly grown on the coastal regions of Latakia and Tartous. The areas of peanut plantations sometimes reach 13 thousand hectares, and they yield an average of 15000 to 20000 tons. Sixty per cent of peanut seeds is exported and the rest is used for food.

Sunflower seeds are grown in small quantities. In 1971 the crop of such seeds reached 2600 tons, most of which was used for food. In 1969 and 1970, up to 700 tons of sunflower seeds were pressed. Experiments on Soya growing are under way. The yield was encouraging. Unfortunately, there are no research centres for the production and development of oil raw materials. The committee known as "The Permanent Committee for Encouraging Oil Seeds Growing" is inefficient. It is expected that growing of

oil seeds would be greatly increased in the coming years due to the utilization of the Euphrates basin.

A. Transport and Storage

a. Transport

Cotton seeds are carried from the cotton gins to the oil presses in bags of 45 kg, of capacity. Such means of conveyance usually cause damage to the bags during loading and unloading operation In neighboring oil presses, set up at certain plants in Aleppo. the seeds are moved by air pumps.

Next year, Aleppo Oils Company will launch a project for moving and storing cotton seeds in loose form, using air pressure for loading and unloading. Such process will save the costs of transportation, unloading and storage of seeds, carried out alternatively at present, in addition to the saving of the costs of tear and wear of bags.

B. Storage

At present, cotton seeds are stored in bags at vegetable oil companies. where they are piled in heaps or stows, in ventilated warehouses or in the open air, covering them with turpentine canvas. In both cases. the seeds are exposed to a certain amount of damage due to the inadequate ventilation, and the temperature of seeds rises as their humidity rises because of exposure to various atmospheric factors which would activate the biological processes in the seeds.

It is worth mentioning in this connection that Aleppo Oils Company will start next year the execution of warehouse ventilation project.

Technical & Production Aspects

1. Cotton Seeds:

Production & Production Capacity

In the Syrian Arab Republic, there are five companies which comprise seven factories owned by the public sector. These factories are specialized in pressing seeds, extracting oils and processing vegetable fat in addition to soap industry. Also, there are several factories which belong to the private sector, but they are of minor importance. The following companies belong to the public sector:

a. The Syrian Industrial Company for Vegetable Oils, Aleppo. It comprises three factories which produce soap and hydrogenated oil.

b. Sugar and Agricultural Products Company, Homs. It comprises a soap and oil factory which produces oil, soap and hydrogenated oil.

c. Hama Oils Company. It produces oils.

d. Damascus Oils Company. It produces oils and soap.

e. Latakia Oils Company. It produces oil.

The following table shows the actual and maximum production capacity of these companies:

Name of Company	Maximum Production Capacity in 24 hrs.	Maximum Production Capacity in 300 days	Actual Production Capacity in 24 hrs.	Actual Production Capacity in 300 days	Average Pressed seeds in past 3 years	Rate of Benefiting from max.capacity
Aleppo Oils Company	600	180000	525	157500	151000	
Homs Oils Company	95	28500	80	24000	18000	
Damascus Oils Co.	75	22500	66	19800	18000	
Hama Oils Company	62	18600	60	18000	18000	
Latakia Oils Company	33	9900	30	9000	9000	
Total	865	259500	771	228300	214000	83%

The above-mentioned companies turn out main products and by-products for local consumption. Part of the production is exported. Such production includes refined cotton seed oil, vegetable fat. soap. cotton furr and cotton seed husk.

The specifications of the products are generally good and are comparable to world specifications. Oils Companies abide by the specifications of the Ministry of Supplies.

These specifications, however, have to be revised, since they left unspecified certain important aspects such as oxidized acidity, the ratio of citric acid in oil, and that ratio of the hyrogenating agent in fat etc. Currently, new specifications are being drawn up by the Centre of Standard Specifications with the cooperation of the oils companies.

In respect to the specifications of cottonseed cake, they are acceptable in view of the rate of carbohydrates found therein. The rate of protein, however is low, as it is about 35% while the rate accepted in world markets is 40% and above. Furthermore, some companies press the seeds without removing the hull so they turn out cottonseed cakes with a very low rate of protein amounting to about 23%. On the other hand, the cottonseed cake meant for export is preferred to be in the form of granules in order to facilitate its transport by air pressure as well as its loading and unloading from ships, not to mention the possibility of better preservation.

The specifications of cottonseed hull are good. Nearly all of it is exported. Oil companies buy cotton seeds from the Public Estbl. for Cotton Ginning & Marketing which supervises cotton ginning, marketing and export operations, and cotton seed marketing, as well. The quantities of raw materials vary from one season to another according to agricultural conditions. The following schedule shows the quantities of pressed seeds:

Season	Quantities of Pressed Seeds
1965	249000
1966	220000
1967	220000
1968	200000
1969	200000
1970	206000
1971	210000
1972	224000
1973	214000

If we compare these quantities with the maximum production capacity of olive oils companies. we notice a waste of capacity of 17%.

Seed oils are delivered by government gins to vegetable oil factories on the basis of the following specifications:

Cotton Seed Hull	13% of the seed
Oil	18.5% of the seed as a minimum
Moisture	12% of the seed as a maximum
Acidity	1-8% of the seed as a maximum
Bulk	2% of the seed as a maximum

Such specifications raise the quality indicator to more than a hundred considering amonia to have a ratio of 3.5%. In other words, the seeds enjoying these specifications are considered of a good quality. However, the seeds. in reality, digress a great

deal from these specifications, sometimes. This happens when cotton receives early rain water and, thus, the seeds are stored while wet. The seeds as a result, rot due to lack of ventilated warehouses.

Agreement is reached between vegetable oil factories and the Public Establishment which supervises ginneries, on the specifications accepted at fixed prices and on specific rates of compensation, when and if specifications undergo any changes. The following is a schedule showing the increase of the price of seeds during the past years and how it compares with World prices:

Season	Price of Seeds/ton	World Price of Seeds/ton
1965	S.P. 18	S.P. 26
1967	" 20	" 30
1970	" 22	" 34
1974	" 24	" 60

We notice from the figures given above that there is great difference between the prices of seeds produced in Syria and those available in World markets. Nevertheless, the State prefers to maintain low prices of seeds so that the citizens will be supplied with oils at low prices.

Inasmuch as raw and other auxiliary materials are concerned, they are all imported including chemicals; packing and filling material.

2. Olives:

In the Syrian Arab Republic, there are 986 olive presses, of which, 526 are operated by machines and the rest by animals, and they all belong to the private sector. Most of these presses are still primitive. The State is endeavouring to raise their technical standard by compelling their owners to renew the equipment for the purpose of obtaining better returns. These presses are run for the account of their owners or they are hired out for pressing Olives of others. Olives are picked and pressed under unsound conditions, for they are picked by beating the branches with sticks. By so doing, the olives are injured, the oil in their meat becomes oxidized and the degree of acidity becomes higher. After transporting these olives to the press and stowing them for a considerable period of time before being pressed, the acidity will increase once again.

After the process of pressing there will remain in the cake a ratio of oil ranging between 7% in modern oil presses and 13% in old type oil presses. The cake is then carried to extraction plants which are six in number and which are located in Aleppo, Latakia and Tartous. The oil is extracted by means of dissolvents. The production capacity of those plants reaches 100,000 tons of cake. The plants are very old and they are owned by the private sector, and they operate under non-technical conditions and use petroleum ether as solvent. The oil extracted has an acidity which varies from 20 to 50% at the end of the season. The average of cake oil produced during the last few years, reached about 5000 tons.

As a matter of fact, the olive oil extraction industry and that of Mitrof (cake) oil requires development and improvement of production operations in order to increase

the output and reduce oil acidity; and then it will be possible to refine the Mitrof oil and use it for food instead of using it for making soap.

The following schedule shows the oils and fats produced between 1965 and 1972:

Description	1965	1966	1967	1968	1969	1970	1971	1972
Cotton Seed Oil (tons)	36000	31000	26000	22900	26300	25100	26447	27395
Olive Oil (tons)	1400	25000	24000	31900	35800	15500	22200	33500
Butter & Natural Fat	00	00	00	13408	11916	9024	7575	00
Vegetable Fat	5000	6000	4000	4000	5700	6500	7300	8300
Total	55000	62000	54000	62208	69516	56124	63522	69195

In the above schedule. we notice that cotton seed oil production is increasing continually due to a decrease in the quantities of exported seeds, and that olive oil production is increasing due to improvement of cultivation and increase of crop.

Production of butter and natural fat decreased due to recent bad agricultural seasons. Vegetable fat, however, increased by 400% which indicated that the Syrian

consumer has become used to this product and has been encouraged by the great difference in price between vegetable fat and animal fat.

Consumption

The following schedule shows the estimated oil consumption (in tons) during the period 1968-1972:

Consumption = Production + Import - Export

Description	1968				1969				1970				1971				1972			
Cotton Seed Oil	29900	00	9924	12976	26300	00	6250	20050	25100	00	8364	16736	26247	00	2300	24044	27395	00	00	27395
Olive oil	21900	737	265	22275	25600	422	740	25302	15500	20	383	15137	22200	24	00	22224	33500	00	00	33500
Butter & Local Animal Fat	13408	1883	447	14944	4916	4563	380	16096	9024	630	236	15497	7575	586	6	13436	00	50	6	4506
Processed Fat	4000	20	00	4020	5700	34	27	5707	6500	16	54	6462	7300	270	00	10030	8300	34	00	8644
Total	62208	2640	10736	54112	29516	5039	7397	67158	58224	6745	9037	53932	63322	8678	2306	69524	69195	5885	516	74045

The figures projected in the schedule above show the continued increase in consumption of oils, a matter which led the Government to prohibit the export of cotton seeds. cotton oil and olive oil, as from 1972. It is also noticed that the consumption of butter and animal fats is decreasing due to their high prices compared with vegetable fat, a kilogram of which sells at S.P. 170, while a kilogram of animal fat sells at S.P. 1300. Furthermore, the Syrian consumer has become used to using vegetable fat.

We also conclude from the schedule that the average annual consumption of fat per individual in Syria, is 8.7Kg, a low average compared with that in industrial countries. This average will possibly increase in the future when the standard of living has risen in Syria, which has to be taken into account when expansion and production plans are drawn up in the future.

Country	Average Individual Share Kg/year
Syrian Arab Republic	8.7
Hashemite Kingdom of Jordan	4.5
Tunisia	14.8
England	22
France	22
Italy	15

Description of Production Stages of Processing Cotton Seed

Cotton seed processing includes the following stages:

1. Preparation of seeds

The seeds are emptied from their bags into spiral ducts which carry them to feeder reservoir of Homs and Aleppo Oils Company, the capacity of which is sufficient for turning out two _____ (the second and third). Then the seeds go to automatic scales (Aleppo plants) and from there to sifting and cleaning devices for the removal of impurities, stones and iron particles. The devices are mere graduated sieves which operate on the principle of difference in size and gravity, between the seeds and the impurities.

2. Process of Delinting

In this process, the linters are removed in two stages; first, the lint fibers (long hairs) which usually constitute 1.5-2% of the cotton seed weight are removed; second, the lint fibers (short hairs) which constitute 7-8% of the cotton seed weight are removed. The lint fibers are then tossed by means of air suctorials, into specially designed cleaners in which soil and dirt are detached from the fibers. The fibers are then compressed into bales. The weight of each bale ranges between 200 and 225 Kg. Their compactness is equivalent to seventy cubic feet per one ton. viz. 400 Kg. per cubic metre. Aleppo Vegetable Oil Company owns modern automatic compressors.

3. Seeds Husking Process

This process includes the detachment of hull from the kernels by peelers made up of sets of knives fitted to a rotary disc. Here the knives remove the hull from the seed. Then sieves seperate the hull from the kernel, and the hull is carried by turbines to storage warehouses. At present, Aleppo Vegetable Oil Company is studying the possibility of compressing hull into bales for the purpose of minimizing the space

it occupies, facilitating transport and protecting it against fire.

4. Process of Kernel Masking

To facilitate the pressing operation, the kernels are mashed into waffles, where the oil tissues and cells inside the seed are torn, to render easy the extraction.

5. Pressing

The kernel is pressed in spiral presses provided with stoves. The oil is then strained by sieves and filter presses. There after, it is pumped into assembly tanks, prior to pouring it into the refining apparatus. The cottonseed cake is carried by spiral channels to the fitting section where it is stacked in canvas bags of 70 Kg. of capacity.

At Homs Vegetable Oil Comapny, there is a small plant for extracting oil from slab cake by means of organic solvents. Its output capacity is about 40 tons per day.

6. Process of Refining Oil

A. Stage of Neutralization

Fatty acids are disposed of by using caustic soda. The acids are separated in the form of substock. The oil is washed clean several times with water , then dried and finally carried to the bleaching chamber. The Aleppo Vegetable Oil Company uses these processes uninterruptedly by means of centrifugal force seperators. Other factories follow the interrupted process.

B. Bleaching

At this stage, the coloring substances are disposed of by treating the oil with activated charcoal and bleaching powder. This process takes place in a vacuum. Shortly, there will be installed, at Aleppo Vegetable Oil Company, a bleaching plant

to operate on the basis of the uninterrupted method.

C. Deodorization

This process is carried out in vessels under vaccum and at high temperature. Dry vapour draughts are discharged into and through the oil as an aid for eliminating volatile substances which turn the oil rancid. This process is used at Aleppo Vegetable Oil Company by plants run on the basis of the uninterrupted method.

D. Bottling

The outcoming refined oil is filled in cans of various holding capacity, 5-8-16 Kg. The filling apparati available in the factory are semi-automatic. This year, a modern automatic plant started manufacturing plastic containers and bottling oil. The production capacity of this plant is 1700 containers an hour. The bottling plant covers 40% of the company's production.

E. Processing of Vegetable Fat

Vegetable fat is produced at the Aleppo and Homs Companies by hydrogenating oil through the auxiliary agent nickle formate, or by previously prepared nickle preserved in a fatty medium. Also, hydrogen is produced by electro analysis of the water.

Hydrogenated oil is mixed with the necessary substances and is cooled in Votatose apparatus to give it the appropriate property. It is, then, poured by a semi automatic device to fill cans of various sizes.

It is worth mentioning that the Aleppo Vegetable Oil Company is currently installing modern plants and equipment for refining and bleaching oil by the uninterrupted method

as well as a plant for generating hydrogen and hydrogenating oil, another plant with a capacity of 30 tons per day for the production of vegetable fat, and another with a capacity of ten tons a day for the production of vegetable butter (margerine). Hence, the production of butter and vegetable fat by this company will go up from 4000 tons to 12000 tons yearly.

Contributory Industrial Services:

The most important contributory industrial services are:

- Water and Vapour

In their operation, factories draw their water from interior wells, or water network. Hard water is treated before running into boilers.

- Electric Power

Factories are provided with power generated in their premises or with power drawn from electricity network.

- Maintenance

Routine maintenance is undertaken and supervised by the factory team. Complicated and particular maintenance, on the other hand, is handled at specialized workshops.

- Chemical Laboratory

Here raw and contributory materials are tested, and specifications of produced items are checked. Laboratories of Aleppo Vegetable Oil Company have been provided with modern devices to give quick results of gauging oil and protein of seeds and cottonseed cake, and with humidity apparati which operate by electric conductivity. The laboratories of other companies still lack certain necessary equipment.

Production Processes and Characteristics

Despite the great difficulties encountered by production processes at vegetable oil companies since nationalization, due to old equipment and contrictions of passages connecting factory sections, companies have been able to survive owing to the great improvement of production processes. They have been able, too, to meet more than 75% of development projects. Consequently, extraction returns of all produced material increased. The oil returns, for instance, produced by Aleppo factories rose from 12% to 15% and those produced by other factories, from 12 to 14%. Cottonseed cake returns rose from 5 to 9%. Nevertheless, local industrial returns are at a level lower than that in other industrial countries, because there are still in Syria old type plants where traditional processing ways are being followed. The campaign for renewal and development to this effect should be followed up. The new projects which will be executed at the Aleppo Vegetable Oil Company will inevitably increase the returns. The most outstanding projects, in this connection, are a new plant for uninterrupted refining, a plan for oil extraction by means of organic solvents, ventilation of seed warehouses and drying seeds of a high degree of moisture.

Hereunder, the most important phases of production prevailing in vegetable oil companies are outlined:

A. Labour

1. Redundancy

Redundancy is the most noticeable feature in Labour, due to the lack of previously studied cadres (classified personnel). Hence, following nationalization, the number of workers at certain vegetable oil companies increased by 30 per cent.

The wages also recorded almost the same ratio. The following table shows the number of workers, their wages and the quantities of pressed seeds, after nationalization:

Year	Number of Workers	Wages	Pressed Seeds
1965	1181	2575170	249000
1966	1293	3332587	220000
1967	1369	2490503	220000
1968	1462	4122097	200000
1971	1561	4413215	210000
1972	1572	5320865	224000

The schedule here-above shows that the increasing number of labourers and the increase in the totality of wages in the last few years, is not proportional to the development of economic and productive efficiencies. Naturally, such increase is accompanied by other obligations such as the company's share in the payment of premiums of insuring the workers with the Social Insurances Agency (Establishment), which amount to 17% of the wages, besides other medical expenses. Such wages are considered to be high since they constitute a high proportion in the industrial expenditure (other than raw material), which reaches 20%. Compared with the proportion of wages in a similar concern in another neighbouring community, under the same conditions,such proportion seems to exceed the latter at least by 50%.

There is no doubt that wages should conform to the actual national income. It is necessary, however, to make a survey of the various jobs and positions to show the minimum wages and the annual increment of each job is based on the required qualifications, education, experience and responsibility. At present, the"Centre of Productivity and Administration Development" is studying the cadres proposed by companies and preparing the appropriate system for their application. Here, we deem it necessary to connect wages with productivity.

2. Health Deficiency

The second feature of labour is health deficiency. In fact there is a high percentage of workers who are incapable of working, either due to passing retirement age limit, work accidents or chronic ailment. The percentage of such cases may constitute 20% of the workers' body.

3. Illiteracy

The third feature of labour is illiteracy. The proportion of workers who can write and read is quite low, which makes it hard for them to apply the written instructions connected with processing and technical guidance.

4. Shortage of Technicians

There is a great number of unskilled labourers supervised by a number of technicians and specialists inadequate for carrying out the duties required. This has led to deficient supervision of production sections, dispersal of technicians efforts in the course of production, planning and studying of projects for development and improvement of production. As in the case of workers, the technical staff cadre in the companies also lacks job evaluation survey needed for appointment of

technicians to vacant positions, and for setting up an integrated system which would determine responsibilities and realize social security in both respects, work and wages. In this connection we have to mention the hardships the vegetable oil sector is suffering from. Like other industrial centers. it is losing such technicians, those technicians who quit to join other concerns in the country where better conditions are available. Therefore, such predicament, dimensions of which we cannot discuss here, has to be remedied.

B. Productivity

The workers' productivity at vegetable oil companies is low, and it does not meet work requirements. It does not reach at best 70% due to the following main reasons:

1- Qualification of worker as mentioned heretofore.

2- Lack of training programs on various levels to provide workers with guidance and knowledge of techniques in the field of work and control, and make them aware of such developments and improvements which may gradually affect oil processing methods.lack of such training program is due to the shortage in the number of technicians already mentioned.

3- Absence of internal regulations which would ensure observation of work instructions, and show productive work conditions which will help in making use of productive time and in increasing the output and providing a convenient atmosphere for work.

4- Inadequacy of technical supervision and control due to shortage of technicians.

5- Failure to provide the conditions which could meet personal and health requirements of the workers such as restaurants, health facilities and organized breaks to avoid the use of the work field for such needs.

C. Outturn and Industrial Loss

Husking and Pressing: The loss of oil in the hull, during processing, amounts to 1.5 - 2%, and in cottonseed oil 5.5 - 6%, which means that the average loss of oil during the processes of storage, ginning, delinting and pressing ranges between 14.5 and 15% of the total quantity of oil found in the seed. This proportion is high and it is 10% more than the standard loss under the same conditions. The reason is attributed to various factors, namely, old equipment and reduction of seed specifications while in storage. The following table shows the seasonal change in seed acidity:

Season	Acidity %
First quarter	0.5 - 0.8
Second quarter	0.8 - 1
Third quarter	1.25 - 1.5
Fourth quarter	1.5 - 2

Refining

In refining, the average loss of oil is 10% which is a high proportion since it should be in the limits of 6% only. The rise of the proportion of loss is due to several factors:

- Rottening of seed in storage, which would increase the proportion of oxidized acids which, in turn, increases the proportion of oil lost in the substock.

- Traditional process of refining or old reperators used in the uninterrupted method.

It is recommended that phospheric acid be used prior to the first stage of neutralization, in order to remove all the phosphides and also to use sodium carbonate and caustic soda in the second refining stage. In the washing (cleaning) process, softened water is to be used, because calcium traces found in hard water form substock resulting from loss of oil during the washing operation.

Bleaching and Deodorization

The proportion of oil lost in this process at "Aleppo Oil Company" is nearly within the normal limits, since in the bleaching process, it constitutes 20 -25% of the weight of the bleaching powder. In the deodorizing process, it amounts to 0.1%. The proportion of this loss is higher at other companies as they use old deodorizing equipment or sometimes locally made unreliable equipment. At certain factories, the process of removing the bleaching powder from oil by water vapour is not implemented.

It is recommended that, prior to adding the bleaching powder, a small amount of citric acid be added in order to decompose the traces of remaining substock after the introduction of water for washing the oil, to stop the disintegration of the bleaching powder, which would prompt an increase of its proportion, and hence, an increase of the lost oil proportion and the bleaching powder proportion as well. It is evident that an equal proportion of this acid should be added before the deodorization process to avoid oil oxidation during the deodorization process or while preserving it.

It is worth mentioning, too, that it is possible to have the proportion of loss reduced after the execution of the new projects, scheduled in the 5-year plan, and particularly after the erection of the refining plants and the organic solvents plant.

Industrial Costs

The industrial costs at vegetable oil companies are regarded as high due to the following factors:

- Reduction in seed quantities needed for production capacity.
- Rise in industrial loss
- Rise of wages and increase of workers in a manner not conforming with the development of productivity efficiencies.
- Rise of the costs of industrial services, especially electric power and other industrial services.
- Rise of cost of transport, handling and storage.

The following table shows the rise of industrial services with regard to cotton seeds:

Season	Industrial cost / ton of seeds S.L.
1966	305
1967	319
1968	315
1969	325
1970	357
1971	366
1972	374

This cost is considered high compared with that in the neighbouring countries whose conditions are similar to those in Syria. In Iraq and Turkey the processing cost is equivalent to 80% of that in Syria. However, the most important factor of such rise is the reduced quantities of seed necessary for ensuring maximum production capacity. This reduction reaches about 20%. The fixed production cost constitutes only 15% of the production costs. Therefore, it is possible to reduce the production at least by 15% if the seed quantities are so managed as to meet the maximum production capacity. This requires the removal of constrictions which exist at the production lines.

The cost can be greatly reduced, too, if work days are increased from 270 to 330 a year, provided that maintenance is partially and periodically organized throughout the year without discontinuing completely the production as the case is at present, as maintenance is undertaken one full swoop during the last month of the season, when their operation stops.

Vegetable Oil sector has to cooperate with other sectors to secure raw materials of adequate specifications and quantities.

Marketing

Vegetable Oil Companies used to market their products independently. After nationalization, the State agencies and establishments have been entrusted with this task. At present, marketing of products locally is undertaken by "The Establishment of Consumption", while the "Establishment of Trade" undertakes marketing exteriorly. Vegetable oil companies used to export nearly all their products of husked cotton seed cake (60,000 tons - 43%) and 40,000 tons of unhusked cotton seed cake - 28%, and all their products of linters amounting to (14,000) tons, as well as around 20% of

their oil products, amounting to (50000) tons. In 1972, the government prohibited exportation of oil in view of the need of the local market for such product. Linters, however, continued to be exported. The entire hull product is consumed locally.

Sales of Vegetable Oil Companies are estimated at 100 million Syrian Pounds a year. As to selling prices, they are regarded to be nearly fixed. In fixing the prices, the government follows the high economic policy of the country. The current oil price, for example, is the same as that fixed more than five years ago, despite the increase of cotton seed price, and of the various industrial liabilities. The current oil price is Syrian Piaster 135/kilo, while the price of same in neighbouring countries is nearly the double. which has aroused the oil companies fears lest oil be smuggled to the outside.

Relations of Oil Companies with Other Establishments

Although oil companies are directly connected to the "Food Industry Federation", the nature of their activities has brought them into strong connection with other public establishments, among them:

- The Public Establishment for Ginning & Marketing of Cotton (responsible for supplying cotton seeds)
- Establishment of Consumption (responsible for the sale of cooperative products and materials locally)
- Foreign Trade Establishment
- Customs
- Banks (responsible for import and export of material
- Port Establishment
- Ministry of Labour (responsible for Workers Affairs)

- Power & Water Agencies
- Ministry of Finance Agencies
- Ministry of Agriculture Agencies.

There is no doubt that these establishments and agencies have no direct connection with production. Hence, coordination is very necessary between the activities of these agencies in respect to seasonal production and the setting up of practical handy programmes and projects in order to provide convenient processing conditions, free of any hindrances.

Future prospects of consumption, production and expansion plans:

1. Expansion plans:

Since the days of their establishment until the beginning of nationalization, operation of oil companies developed spontaneously without any previously set plans. These factories were run by their owners (private sector) on the basis of immediate profit. This was the important motive in developing their activities. After nationalization, these companies began to develop in two directions: firstly, renewal of old disused equipment and secondly, removal of the constrictions among the various sections by adding necessary equipment which, naturally and eventually led to the increase of the ultimate production capacity. Similarly, the project of detaching seeds by means of organic solvents, which will be executed in the beginning of next year, at "Aleppo Vegetable Oil Company" will increase the production capacity of the company by 30% and that of the country by 20%. It is also intended to set up, in Deir Al-Zour area, a press plant with a production capacity of 40,000 tons yearly, viz. The total

production capacity in the country will. then, reach approximately 1100 tons daily instead of 860 tons or 330000 tons yearly instead of 228000 tons.

2. Prospects in the Field of Production:

The exploitation of the Euphrates basin will pave the way for intensive agricultural possibilities. If we figure out that the annual increase in the production of oil seeds is equivalent to average World increase viz. 2%, then oil production in the coming years will be as follows:

Year	Production / ton
1970	56124
1971	57246
1973	59559
1975	61965
1977	64468
1979	67072
1981	69781
1983	72600
1985	75533

3. Prospects of increase in production:

Considering the consumption of 1970 as a basis, and the annual increase in consumption to be 4% on the basis that ½ of this increase corresponds to the normal increase of population, and the other half runs along the lines of the rise in the standard of living, we get the results shown in the following table:

Year	Consumption / ton
1970	53832
1971	55985
1973	60554
1975	65495
1977	70839
1979	79685
1981	82872
1983	89634
1985	96948

In the light of this table that consumption in Syria will jump from 53832 tons in 1970 to 96948 tons in 1985. By comparing production and consumption tables, we conclude that the deficiency during the coming years will be as follows:

Year	Production	Consumption	Deficiency
1970	56124	53832	00
1971	57246	55985	00
1973	59559	60554	995
1975	61965	65495	3530
1977	64468	70839	6371
1979	67032	79685	12613
1980	69781	82772	13091
1983	72600	89634	17134
1985	75533	96948	21415

This deficiency represents an increase of 57% with regard to 1970's consumption, viz this quantity represents the sum of 21415 x 500$ = $ 10 million equivalent to S.L. 40 million (less now).

Means proposed to cover this deficiency

Three means may be suggested in this respect:

1- Increase of production capacity
2- Increase of production capacity of raw materials
3- Orientation on the use of vegetable oils.

1- Increase of production capacity:

If we take into consideration the expected increase of production capacity after the removal of constrictions among sections and after the execution of the new scheduled projects as cited in the 5-year plan, such as the extraction plant and the Deir Al-Zour factory, we find that the additional production capacity resulting from these changes will be able to cover 50% of the deficiency expected in 1985.

Therefore, another factory for the extraction of oil must be established in the late seventies, with a production capacity not less than 80.000 ton/year.

2- Increase of raw material production:

This is an extremely important matter which calls for the adoption of all necessary measures. As it is indicated in the above tables, the deficiency is rapidly increasing and particularly that the feature of raw material decrease has become a world problem and with it, the difficulty of obtaining such material from

abroad will also increase. Therefore, it is inevitable that local potentials be relied on. In Syria, there are enormous potentials, and if they are scientifically exploited, the problem of raw material decrease will be easily overcome.

Hereinafter are the main proposals for the increase of raw material.

A. Development of existing industry

Vegetable Oil Companies in the country have greatly developed in the past ten years. This has led to a considerable increase in the output. However, there is still another elbowroom to raise the output, namely the execution of the rest of projects scheduled in the 5-year plan. There will be constructed plants for uninterrupted refining which will reduce the refining loss by 4%. Also, there will be executed the extraction plant project which will reduce the cottonseed cake oil loss by approximately 5% of the weight of cottonseed cake. We also have the project of warehouses ventilation and seed drying project which will minimize the rate of rotting and the rise in acidity by not less than 1% of the weight of the seeds.

At present, the study of an important project is under way by the Cotton Office, namely, the production of cooton seeds of (Cosipole). This project will reduce the loss in refining by way of providing additional caustic soda necessary for removing the dark colour of cottonseed oil, the main cause of which is the colouring (cosipole) substance, and consequently the reduction of the quantity of neutral oil reacting with caustic soda.

Further, there are other factors which contribute to the increase of production, namely, training of workers, improving of their production qualifications, and decrease of waste.

B. Increase of crop production

Vegetable oil production can be increased by the care and attention given to the products of oil crops. To do that, the following steps have to be followed:

1- Encouraging the growing of oil seeds

This can be carried out by drawing up practical plans aiming at helping and encouraging farmers by way of giving them, on loan, sowing seeds and fertilizers and guaranteeing the purchase of their products at encouraging prices, and by dispatching units to provide them with guidance and instruction pertaining to the proper ways of handling oil seeds.

2- Introducing the growing of new species of oil seeds

Under this subject comes the growing of soya, sunflower and peanuts. The relevant experiments undertaken by the Ministry of Agriculture in the past years gave very encouraging results.

3- Replacement of currently used species of oil seeds:

Seeds of low oil content must be replaced by a high oil content species. This is a very important aspect which played a serious role in discouraging the growing of sunflower seeds in Syria during the past five years, since the yield gave non-economic seeds due to the low rate of oil contained in them (35%). As a result farmers desisted from growing this species of seeds.

4- Replacement of the Committee for encouraging the growing of oil seeds

The existing official committee has limited efficiency, running on a par with the cotton office.

5- Realization of Arab Cooperation and Integration

By way of exchange of experiences and limitation and classification of the Arab countries actually grown oil products, and of their kinds and output, and selection of such species suitable to the nature of Arab environment. The Arab Organization for Agricultural Development has an important role in this field.

3. Guidance on the use of vegetable oils

The endevour to give guidance on the proper and ideal use of vegetable oil will inevitably lead to saving a great part of vegetable oil consumed for purposes other than food.

Following are some examples

1- Certain food oils are used in soap industry. These are chesper substitutes.

2- Non-expensive vegetable oils can be used in the industry of vegetable fat by hydrogenating fish oils and certain non-expensive oils and fats in order to leave place for good quality oils to be directly used for food purposes.

3- Improving the methods of extracting and refining (mitrof ?) oil for use in soap industry.

4- Promotion of animal wealth, endevouring to increase the production of natural fat and butter, and refining animal fat.

5- Promotion to fish wealth and introduction of fish oil industry in suitable areas.

6- Studying the introduction of fats industry, using minute organisms.

7- Promotion to petrochemical industry as a source for the production of fat acids, and detergents in order to alleviate the pressure on the use of vegetable oils.

Recommendations

Recommendations can be categorized as follows:

- Recommendations concerning administrative aspects.
- Recommendations on raw materials.
- Recommendations on technical aspects.
- Recommendations on production aspects.

A. Administrative Aspects:

Organizing work by maintaining commercial administrative and financial systems on modern scientific bases. Vegetable oil companies still lack a developed financial and cost estimating system. as well as a standardized work system agreeing with the development of the public sector. Such system should not overlook the strong connection between wages and production to enable the assesment of individuals and their instruction of devotion to work, and the boosting of production. There is no doubt that such systems and regulations are the only way to streamline potentials in clear direction of moves.

B. Raw materials

Insufficiency of raw materials can be overcome by expanding the growing of certain oil producing crops. like cotton. soya, of sunflower and peanuts.

It is worth indicating at this point that the increase of the production of oil-containing seeds must not be limited only to the satisfaction of local oil consumption needs. but it must go beyond it to make export possible since there is an urgent need in world markets for such material. Similarly, the seeds must be considered as an

important source of protein whether for man, cattle or poultry. All expectations confirm that it will be very difficult to ensure this material in the future.

- It is necessary to establish research centres specialized in developing new species of seeds which would give a better yield, and which contain a higher proportion of oil. Such centres may operate along the same lines of the cotton office which has rendered remarkable services in the field of cotton growing.

- Considerable attention and good care should be given to the storage of seeds. The projects proposed by Aleppo Vegetable Oil Company should be executed the soonest possible. Such projects which include ventilation of warehouses and drying of wet seeds must be adopted by other oil companies.

C. Technical Aspects

Replacement of the old equipment by new, and the implementation of investment plans whether with regard to the removal of constrictions among sections or the installation of new plants which would improve the yield and output. Transport, craning and storage should be mechanized.

D. Output Aspects

Providing technical cadres concerning workers and engineers as well as providing a convenient atmosphere for these technicians so that their production would improve. Efforts should be made to put an end to technicians' resignations by way of improving their social and financial conditions.

- Expanding the training capacity of the existing vocational training centres and backing it by the provision of industrial specialization.
- Care to be given to high education and to the developing of studies of food industry and

their application at the universities of the Syrian Region, by establishing a special section for the study and application of oil subjects.

- The establishment of a research centre designated for oil subjects and their application. A certain percentage of the profits vegetable oil companies have to be appropriated for financing the centre.
- Production operations have to be promoted in order to attain a higher degree of output, better products and less costs.
- Making use of processed by-products such as linters and hulls. Recently, cotton seed cake has been used at the newly established animal feed factories.
- Care to be given to animal wealth.
- Introducing biology in processing fat material.
- Care to be given to petrochemical industry as a source for the production of fat acids and detergents, to alleviate the pressure on using vegetable oils.

Processing Animal Feed

Animal feed industry in Syria has not developed as to match with vegetable oil industry. This is due to the non spread of raising poultry and cattle on a large scale, not to mention that cattle owners depended chiefly on pastures or they themselves prepared blends of feed in haphazard ways.

It was nearly five years ago when cattle and poultry husbandry began to spread tangibly, as signs of a meat crises appeared, which led to a great rise in meat prices, and, hence to establishing factories for processing animal and poultry feeds.

In Syria, there are, at present, six factories for processing poultry feed, the total production capacity of which is 60 tons daily (8 hours of work), or 1800 tons a year. In Damascus, there are four of them, the total capacity of which is 34 tons a day and

the rest are distributed in other districts.

Recently, seven factories have been licensed to operate. Their total capacity amounts to 56 tons a day (8 hours of work). They all belong to the private sector.

On the other hand, the State has recently made an agreement for establishing a number of husbandries in various districts of the Syrian Region, an indication of a great development in poultry husbandry and feed.

The installation of two public sector factories is under way; one in Aleppo and another in Hama. The annual capacity of each, amounts to 60.000 tons, and they are modern automatic factories which will produce poultry and animal feeds. The State has also made agreements for establishing a number of cattle husbandry farms.

Most of the raw materials used in blending feed is available locally, such as wheat, barley, maize, cottonseed cake, red beets and ground bone, vitamins and soyaseed cake which are imported commodities.